



# NJ Water Monitoring Council

## Measuring What Counts for Clean & Plentiful Water

January 21, 2015  
MEETING MINUTES

### Member Attendees

**NJDEP – WM&S:** Leslie McGeorge, Alena Baldwin-Brown, Brian Henning, Helen Pang, Vic Poretti, Bob Schuster **NJGWS –** Ray Bousenberry **OS –** Gary Buchanan, Sandra Goodrow

**NJDOH –**

**USGS –** Bob Reiser, Pam Reilly, Tom Imbrigotta

**USGS (retired) -**

**DRBC –** Tom Fikslin

**EPA R2 –** Kathleen Foley

**IEC –**

**NJ Pinelands Commission –**

**NJ Water Supply Authority –** Heather Desko

**Rutgers (Coop Extension Service) –**

**Rutgers (IMCS) –**

**Rutgers (Env. Bioengineering) –**

**Montclair University –** Meiyin Wu

**Monmouth University/Urban Coast Institute –**

**Stockton College –**

**Meadowlands Environmental Research Institute –** Christine Hobble

**NOAA –**

**Monmouth County Health Dept –** David Sorenson

**Barnegat Bay Partnership –**

**Stony Brook-Millstone Watershed Association –** Erin Stretz

**Musconetcong Watershed Association –**

**Raritan Headwaters Association –** Bill Kibler

**NJ Harbor Dischargers –** Ashley Slagle

**Brick Township MUA –** Glen Hamelink

### Guest Speakers/Discussion Leaders

John Abatemarco – NJDEP/DWM&S

Mark Brigham – USGS

Chris Kunz – NJDEP/DWM&S

Mark Olson – National Atmospheric Deposition Program (NADP)/U. of Illinois

Bruce Ruppel – NJDEP/OS

Anne Witt – NJDEP/DWM&S

### Other Attendees

Mike Aucott – NJDEP (retired)

Julia Barringer – USGS (retired)

Olga Boyko – NJDEP/DAQ

Greg Cavallo – DRBC

Jon Dugan – NJ Watershed Ambassador

Jeff Fischer – USGS NJWSC

Jack Gibs – USGS (retired)

Heather Heckathorn – USGS NJWSC  
Nina Odunlami – NJ Watershed Ambassador  
Alex Pollisar – NJDEP/OS  
Natalie Sherwood – Montclair University  
Zoltan Szabo – USGS NJWSC  
Rudy Zsolway – NJDEP DAQ

- **Council Business** (Copies of the agenda, minutes and many of the information updates and presentations will be available on the Council’s webpage, under “Meeting Information” - <http://www.state.nj.us/dep/wms/wmccmeetinginfo.html>)
- Minutes from the 09/24/14 Council meeting were approved.
- Next NJWMC meeting is scheduled for May 20 at USGS NJWSC
- Suggested Technical Theme for the May meeting is Watershed Association/ Local/Volunteer Water Monitoring. Contaminants of Emerging Concern and Wetlands were also suggested for either the Fall 2015 or Winter 2016 meetings.
- Information Updates, Presentations and Announcements:
  1. Membership Updates – **New Member:** Angela Gorczyca has joined the Council representing the Raritan Headwaters Association.
  2. Announcements – 1. Alena Baldwin-Brown announced that it is time for the annual update of the NJ Continuous Monitoring Inventory. She will send the current spreadsheet to Council members for review [NOTE: this was done on January 29]. She also mentioned that the static maps, that accompany the spreadsheet, are being converted into interactive maps so that users can click on a station location and - where the data are available online - be taken directly to the associated data (similar to the hyperlinks in the spreadsheet). Bob Schuster questioned how to add continuous data from aircraft remote sensing and the Slocum glider. Alena agreed to investigate possible accommodation of this request. 2. Bob Reiser announced that Daryll Pope is now on a 1 year detail to the national USGS offices as the National Ground Water Monitoring Network Chief. 3. Bob Reiser also announced that Pam Reilly will also now be taking on the functions of the Communications Coordinator for the USGS NJWSC. As such, she’ll be spending ¼ of her time working to improve the NJWSC’s communications functions such as publications, reports, social media, web page updates, etc. 4. In line with the previous announcement, Pam Reilly announced that the USGS NJWSC will be establishing a newsletter to be published 2x/year, that links to new publications/reports will be available on the NJWSC’s homepage, that a new Ground Water Level Mapper would be available from the NJWSC’s webpage on January 22, and – as part of a planned webpage update - she would like to survey the NJWMC members regarding different mechanisms by which they prefer to obtain information. 5. On behalf of the Pinelands Commission, Leslie announced that the next Pinelands Research Series presentation would be on February 18 and would feature a presentation on mercury in the Absecon Creek and in the Atlantic City reservoir system. A flyer regarding this presentation was available as a handout.
  3. National Water Monitoring Information from the National Water Quality Monitoring Council (NWQMC) – Leslie shared pertinent information and draft minutes from the Fall NWQMC tele-meeting, including: a. a call for articles for the next edition of the Council’s newsletter, the Council’s new YouTube site, and the recent “Monitoring During Extreme Events” webinar, which was a reprise of a panel presented at the May 2014 National Water Monitoring Conference. Leslie presented some of NJ’s water monitoring experiences following Hurricane Irene, Tropical Storm Lee and Superstorm Sandy as one of the four presentations featured in the webinar (which is now available on the Council’s YouTube site - <https://www.youtube.com/user/NWQMC>); b. updates on the National Network of Reference Watersheds, including a targeted website release of March 2015; c. the ongoing work on the addition of biological community data to the national Water Quality Portal, as well as work on the vision for the future of the Portal to be a 1-stop shop to access both surface and ground water quality data; d. a reinvestigation of the National Monitoring Network for Coastal Waters and their Tribs with a focus on developing a data inventory, as well as identifying monitoring gaps; and e. updates on the status of the National Ground Water Monitoring Network, the addition of some biological protocols to NEMI (National Environmental Methods Index), and the use of AUVs (“subsurface drones”) by some USGS Water Science Centers for collection of temporally and spatially

dense data for modeling. The final minutes and presentations from the tele-meeting are now available on the NWQMC website: [http://acwi.gov/monitoring/ppt/telecon\\_072914/index.html](http://acwi.gov/monitoring/ppt/telecon_072914/index.html).

➤ **Session – Environmental Mercury**

A. *Mercury in the Nation's Streams – Levels, Trends and Implications* – Mark Brigham (USGS)

Mark Brigham summarized the results from a recently released USGS national study related to mercury in streams. Mark explained that mercury is a potent neurotoxin that can accumulate in fish to levels of concern for both humans as well as other fish-eating wildlife - thus the need for fish consumption advisories, which exist in every state in the US, and for which the numbers have gone up steadily over the past 20 years. The USGS report indicates that coal combustion is the largest source of mercury in the US currently, with metals and gold mining close behind (gold mining is an issue of particular concern in the Western US). Additionally, the study showed that wetlands environments are very sensitive to even small amounts of mercury as methylation occurs quickly in this type of environment. As expected, mercury deposition is highest in urban areas, yet the study also showed high mercury fish concentrations in some undeveloped areas, which is believed to be a result of the amount of methylmercury in the water. Other observed trends around the nation included: relatively low methylmercury levels around a known mercury emissions hotspot (MA); a reduction in wet deposition in northern MN and an accompanying reduction in methylmercury in both water column and fish in some lakes; and an increase in mercury levels in fish in Ontario, Canada. Specific to NJ, some of the state's streams were among the highest in mercury in fish and methylmercury in water and sediment. Specific areas included the Passaic River at Millington, Muddy Run at Centerton, and the Great Egg Harbor at Sicklerville. Mark articulated that since fish are the most important piece of monitoring mercury for trends, due to the bioaccumulation factors, continued emphasis should be placed there. Additionally, managing water levels in wetlands and impoundments may be one way to help minimize methylmercury production in these streams. Finally, new tools are available for understanding mercury sources (e.g., high resolution isotope measurement). Additional information on this study can be found at: <http://water.usgs.gov/nawqa/mercury>.

B. *Key NJ Mercury Task Force Recommendations in NJ, Progress and Trends* – Leslie McGeorge (DEP/WM&S) and Sandra Goodrow (DEP/OS)

Leslie McGeorge provided an overview of NJ's two stakeholder-based Mercury Task Forces (1993 and 1998-2001) as well as the activities of the present DEP/EPA/USGS Mercury Workgroup. Leslie was the DEP lead for the 2<sup>nd</sup> NJ Mercury Task Force and is a member of the current Mercury Workgroup. The Task Forces had different charges - MSW incinerator control: Task Force #1 and Hg impacts/sources/comprehensive reduction plan: Task Force #2. Summaries of the key recommendations, as well as progress made on these recommendations were presented. Examples included removal of mercury from products, reduction of in-state air emissions sources, recent development of routine mercury fish tissue monitoring, maintenance of air deposition monitoring, management of mercury dental amalgam waste, development of mercury TMDLs, and use of state-of-the art water monitoring methods.. The current Mercury Workgroup focuses on facilitating communication on mercury reduction actions and progress, supports DEP's Mercury Environmental Trends chapter updates and develops new recommendations for consideration.

Sandra Goodrow, who oversees DEP's Environmental Trends efforts, shared the latest version of the Mercury Emissions trend chapter which shows that the current greatest categorical contributor is mercury from products in general use, with refined fuels combustion and oil refining shortly behind. Sandra indicated that DEP would like to update its emissions inventory and if any members/member organizations have mercury data they'd like to share, please contact her. The Environmental Trends chapters are available online at: <http://www.state.nj.us/dep/dsr/trends/index.htm>.

C. *Mercury Deposition Network: National and NJ Results* – Mark Olson (National Atmospheric Deposition Program/U. of Illinois)

Mark Olson summarized the National Atmospheric Mercury Network (NADP), which is a cooperative research program run out of the U. of Illinois, designed to both measure wet and dry deposition of pollutants using a combination of several types of monitoring networks – weekly sampling for trends, atmospheric mercury, mercury deposition, and ammonia monitoring. The NADP consists of 515 sites in 345 locations, both in the

US as well as abroad; there are 100+ cooperators representing federal, state, and tribal organizations, academic institutions, industry and international environmental agencies. All data are publically available on the web. The Atmospheric Mercury Network, which is part of the NADP, collects both gaseous and dry deposition data. There are 4 dry deposition sites in NJ, however, none are in the network – Brigantine, New Brunswick, Chester and Elizabeth. The Mercury Deposition Network, also part of the NADP, collects wet deposition data – the only NJ site is in New Brunswick. Together, data from these networks are used to predict both wet and dry deposition estimates for both model evaluation, as well as for trends work. In addition to a national snapshot of both mercury concentrations and wet deposition, Mark shared that the New Brunswick site is showing evidence of a decrease in monthly deposition/year. Mark mentioned that a paper focusing on regional trends, authored by David Gay and Peter Weiss, is expected to be published soon. He also mentioned that ideas for funding partnerships for the NJ site would be welcomed. Additional information about the National Air Deposition Program can be found at: <http://nadp.isws.illinois.edu>

*D. Statewide Mercury TMDL for Non-tidal Waters – Anne Witt (DEP/WM&S)*

Anne Witt shared information about NJ's first statewide mercury TMDL, based on fish tissue concentrations resulting primarily from air deposition. Anne provided background on TMDLs in general, as well as mercury-related fish consumption impairments in NJ. She then explained the approach that NJ took, as well as the model it followed, to develop its TMDL, including consideration that the final product would complement regional efforts that were underway in the rest of the Northeast. Included in the explanation of the approach were targets, data analyses, required reductions, source assessments, and TMDL calculations in order to meet the targets. Additional information on the TMDL can be found at: <http://www.nj.gov/dep/wms/bear/tmdls.html>.

*E. Mercury in Fish Tissue in NJ and Transition from Research to Monitoring – Bruce Ruppel (DEP/OS) and John Abatemarco (DEP/WM&S)*

Bruce Ruppel and John Abatemarco detailed the research/monitoring associated with mercury concentrations in fish tissue, and the recent transition from a research effort to a regular monitoring program. Bruce shared the history of the work that was done by the Division of Science & Research in the 1980's and early 1990's related to mercury, PCBs and dioxin contamination in fish. Mercury was found to both bioaccumulate and biomagnify in the aquatic food chain, and can have toxic effects on both wildlife as well as human health. This information was used in the development of fish consumption advisories in NJ for both the general population as well as high risk individuals - the 1<sup>st</sup> advisories were developed in 1994. Bruce explained that annual updates of these advisories, including appropriate species to include, require updated data and, without a routine monitoring program to acquire these data, the advisories could be either overly or under protective of human health. A research project related to establishing a fish tissue monitoring program in NJ, conducted by the Office of Science in various regions around the state, showed that mercury was present in all fish species tested and in almost all fish sampled throughout the state. It also found that higher tropic level species (e.g., chain pickerel, largemouth bass) generally produced the highest mercury concentrations, significantly higher levels of mercury were found in Pinelands fish, and while mercury levels have declined since those seen in the early 1990's, mercury still remains at elevated levels. Recommendations from this study included continuing routine mercury monitoring in fish (for revising/updating existing advisories, and evaluating the fish consumption use), continuing to develop "trackdown" protocols for fish contamination, and development of fish tissue environmental monitoring using standardized species/length/age parameters, among others. Additional information on this research can be found at: <http://www.state.nj.us/dep/dsr/mercury/>. Fish consumption advisory information is available at: <http://www.fishsmarteatsmartnj.org/>.

John explained how DEP's Bureau of Freshwater & Biological Monitoring – as part of its continuing collaboration with the Office of Science - took the research effort, mentioned above, and has begun to transition this into a limited-scope, routine, regionally-based freshwater monitoring program in 2014. The data will be used to update fish consumption advisories and evaluate the fish consumption use as per the Clean Water Act. He provided the criteria by which monitoring stations were selected (e.g., previous OS data and targeted by anglers), as well as the analytes being sampled (mercury, PCBs/OCBs/PBDEs) and the different methods used to sample for each (fillet vs plug). He also shared the anticipated next steps for this fish tissue monitoring including need for regular analytical funding beyond 2015/2016, the need for an efficient tissue analytical

contract, the addition of a probabilistic component to the program (for status & trends), as well as the addition of emerging contaminants as needed.

*F. Mercury Fish Tissue Monitoring in the Delaware River (inc. DNREC Mercury Methylation Study in the Delaware River Zone 5) – Tom Fikslin (DRBC)*

Tom Fikslin provided an overview of DRBC's mercury in fish tissue program including objectives, sampling design, analytical methods as well as a summary of 2004-2012 results. As part of this program, 9 total samples were collected and analyzed for mercury from both tidal and non-tidal portions of the Delaware River Basin from 2004-2007, 2010 and 2012. Two species of fish – pelagic and benthic species – were collected at each site. Results showed that in non-tidal waters, mercury concentrations were higher in pelagic vs benthic species, while in tidal waters, little difference was observed between pelagic and benthic species. Both pelagic and benthic species mercury concentrations were all less than the recommended EPA tissue criterion of 0.3 ppm. Concentrations may exceed levels established by states to protect sensitive subpopulations, such as women of child-bearing age and children. Since impaired water decisions are based upon the existence of consumption advisories, DRBC's 2014 Integrated Report showed both non-tidal, as well as tidal portions of the Delaware River/Bay listed as impaired due to mercury in fish tissue.

Tom also presented the results of studies conducted by the Delaware DNREC and DRBC in Zone 5 of the Delaware River. This study focused on total Hg, Methyl-Hg and methylation rates in the section of the river shared by Delaware and New Jersey. The study showed three overall findings of import:

1. Water column dissolved total mercury and suspended particulate total mercury and methylmercury varied little between sites and seasons.
2. Water column dissolved methylmercury, sediment methylmercury and pore water total mercury, varied seasonally.
3. Total mercury concentrations in the study area are not significantly higher than other east coast estuaries.

In addition, mercury concentrations in striped bass have dropped below the 0.3 ppm criterion between 2002 and 2012.

*G. Statewide Surface and Ground Water Mercury Monitoring – Chris Kunz (DEP/WM&S) and Ray Bousenberry (DEP/NJGWS)*

Chris Kunz and Ray Bousenberry provided mercury concentrations found in both surface and ground water in NJ. Chris detailed the evolution of surface water monitoring for mercury, including explaining that from 2004-2014, ambient surface water mercury concentrations were often non-detectable or below the reporting limits of the older analytical method being used. This showed the need for a consistent lower level analytical method to achieve measureable results. Several studies in both rivers/streams and lakes, using a USGS method that could produce lower level results, validated the use of such methods. This is important because EPA requires use of "sufficiently sensitive" methods, NJPDES dischargers are required to use EPA's method 1631E (similar to the USGS method), NJ's statewide TMDL as well as the Mercury Workgroup's Action Plan recommend comprehensive, long-term mercury monitoring in surface water, and one of the Mercury Task Force recommendations had been to use state-of-the-art methods to provide lower detection limits. Chris shared that the DEP Bureau of Freshwater and Biological Monitoring will begin shortly to use an adequately sensitive, EPA mercury method (1631E) in its river/stream monitoring networks.

Ray shared information regarding mercury levels in the statewide ambient shallow ground water monitoring network. The network, which samples wells in agricultural, urban and undeveloped areas around the state, has just completed its 3<sup>rd</sup> cycle of sampling. Overall, mercury is detected in less than 20% of wells in all sampling cycles. The reporting limit changed 5 times over the last 15 years, making trend analysis difficult. However, the detection distribution is equal between sampling cycles and the estimated mean concentrations between cycles can be considered equal. Of those detections, the majority are found (geographically) in the Coastal Plain and (based on land use) in agricultural or urban land use areas.

*H. Variability of Mercury in Waters, Soils and Sediments of the NJ Coastal Plain – Pam Reilly (USGS NJWSC)*

Pam Reilly provided an overview of work done by the USGS NJWSC related to mercury in the waters, soils and sediment in the Coastal Plain. According to the work presented, mercury affects 8 counties and >70 townships in this geographic area. Atmospheric deposition is considered the largest contributor of mercury to New Jersey's soils and surface waters. Other sources include historic pesticide and fertilizer usage on golf courses and row crops. Secondary sources may include mercury cycling through the environment and surficial disposal of mercury-laden backwash brines from domestic water treatment systems. Historic USGS ground water studies were done to identify possible sources of mercury, document baseline concentrations in various media, and identify land use as well as hydrologic effects of mercury mobilization within the Coastal Plain. The studies focused on temporal and spatial variability, characterizing mercury in local soils, sediments, seepage and at the water table, as well as ground water-surface water interactions. Results showed that point sources (e.g., landfills, military operations, etc.) could not be conclusively linked to residential ground water contamination. Variability was likely due to varying geochemical conditions and mobilization of colloids/particles through the soil to the water table. Additionally, the studies showed that there were elevated mercury concentrations present in the shallow groundwater discharge to streams of the Coastal Plain. It appears that both runoff and ground water discharging to streams are significant contributors of mercury to streambed sediments and surface waters. Questions still remaining include: What is the nature of the particles associated with total mercury in groundwater, are there chemical combinations, such as those from leach field effluent, that are more effective in mobilizing mercury from soils in the subsurface, and is mercury leached only from soils or can it also leach from aquifer materials.

➤ **Action Items**

- Investigate mechanism to include aircraft remote sensing and Slocum glider data in Continuous Monitoring Inventory – *Alena*

➤ **Technical Topics for Next Meeting**

Watershed Association/Local/Volunteer Water Monitoring

➤ **Next Meeting**

May 20 at USGS NJWSC

## Gaps/Needs in Environmental Mercury Monitoring

What are priority data gaps and needs for future monitoring and assessments?

### General

- Lack of current national environmental mercury (Hg) monitoring data to do long term trend analyses – much national Hg monitoring ended in late 1980's; current efforts consist of assembling various existing data sets from the 1990's and beyond; continued national Hg trend data would add to NJ's Hg data and serve to compare NJ information with rest of the nation
- Lack of adequate national and NJ spatial coverage of fish tissue, sediment content and water concentration of Hg and MeHg data collected by multiple agencies in streams, lakes and estuaries. Completion of historical data compilation and geodatabase creation needed.

### Air Deposition

- Need to continue Hg air deposition data at New Brunswick site and study trends in Hg deposition (NOTE: follow progress of MDN Regional Trends paper)
- Additional Hg wet deposition monitoring sites (beyond the 1 existing New Brunswick site) would be beneficial
- Update the NJ mercury air emissions inventory
- Need wet/dry deposition comparison & total deposition (have particulate Hg data from NJDEP validated for use)
- Study how effective reductions in air emissions have been on reducing Hg in surface water. Try to assess the length of time before reductions in air emissions can result in observable decrease in mercury in surface water and in fish tissue
- Need air deposition information related to storm tracks (do coastal environments have increased deposition?)

### Fish Tissue

- Evaluate the need for methylmercury monitoring in fish tissue (e.g., DRBC data shows that 59-72% of Hg is methyl). Monitoring programs are not routinely tracking methylmercury concentrations in fish tissue on a regular schedule
- Continue routine periodic monitoring of fish tissue for revising and updating existing consumption advisories and fish consumption use attainment
- Need to find/establish an efficient fish tissue analytical contract
- Need to establish sustained routine funding for fish tissue monitoring beyond FY15/16
- Need to add a probabilistic component to targeted fish tissue monitoring site selection for statewide status and trends information
- Continue to develop "trackdown" protocol for fish contamination.
- Develop fish tissue environmental monitoring using standardized species/length/age parameters
- Conduct research into Persistent Bioaccumulative Toxins, including low level chemical analysis and low level and passive samplers (e.g., C.L.A.M).

### Analytical Methods

- Monitor mercury water quality in both surface and ground water using analytical methods at the lowest feasible levels (ppt) of detection to produce quantifiable results and trends
- Collect Hg samples for analysis of Hg isotopes, to differentiate possible sources in water, sediments, precipitation and biota
- Need to better understand the role of particulates and colloids in Hg mobilization

#### Surface Water

- Develop better understanding of sources and conditions in local estuaries (e.g., Great Egg Harbor) that lead to elevated mercury concentrations in sediments and fish
- Need to consider sampling for methyl mercury in surface water monitoring networks.

#### Ground Water

- More study of the movement of Hg through different soil types to GW
- Determine contribution of groundwater loading to mercury load in surface waters in Pinelands or Coastal Plain region as a whole
- Examine the role of Backwash brine effluent in ground water “re”contamination. Movement from overland discharge through unconsolidated materials may be a secondary source

#### Pinelands

- Develop better understanding of sources and conditions in the Pinelands that lead to elevated mercury concentrations
- Develop better understanding of chemical conditions in the Pinelands that lead to elevated mercury concentrations in groundwater in some places but not others

#### Soils/Sediment

- Collect more Hg data in soils to study accumulation of Hg over time - soils are largest reservoir of deposited Hg (e.g., litterfall, O/B horizons and aquifer cores in areas of different land uses)
- Collect more data on Hg concentrations in saturated and unsaturated zones, as part of the investigation of transport of Hg from soils to groundwater

#### Wetlands

- Study how methylation rates vary in wetlands

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#### Additional gaps that were suggested by USGS after the January 21 meeting:

- Age date lake cores in the Pinelands to compare to Kroenke and others’ data on mercury to see if elevated in the Pinelands and by how much
- Target storm events for collection of Hg samples at long term Ambient SW Monitoring Network sites -- tie into proposed NJDEP storm water sampling plan
- More study of the effects of septage on Hg mobilization from soil to ground water